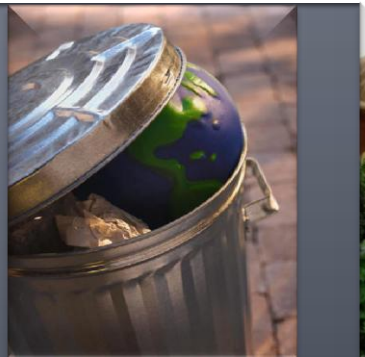
Groundwater Protection in McHenry County

Towards A Sustainable Water Supply

Cassandra McKinney
McHenry County Government

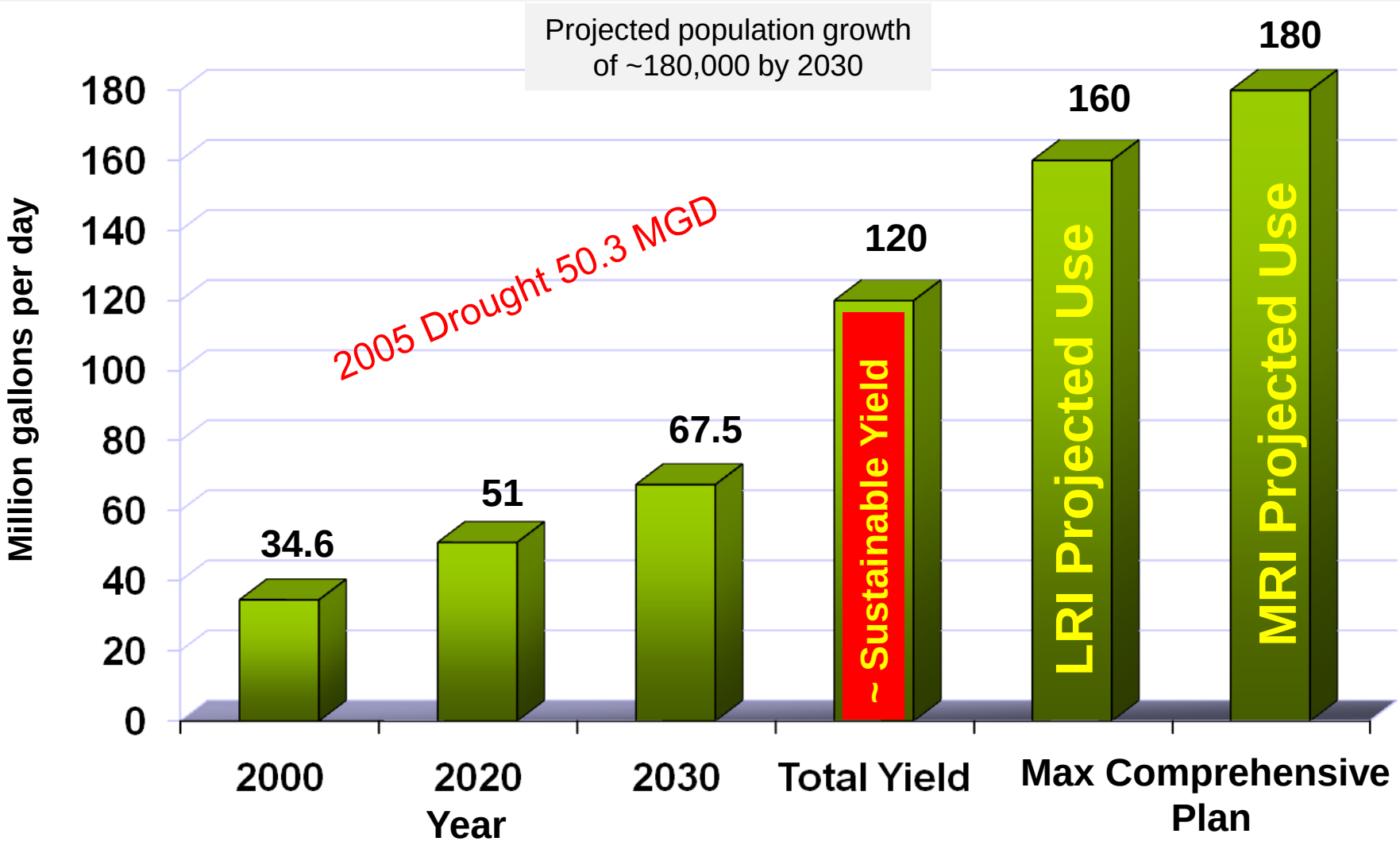





McHenry County Challenge

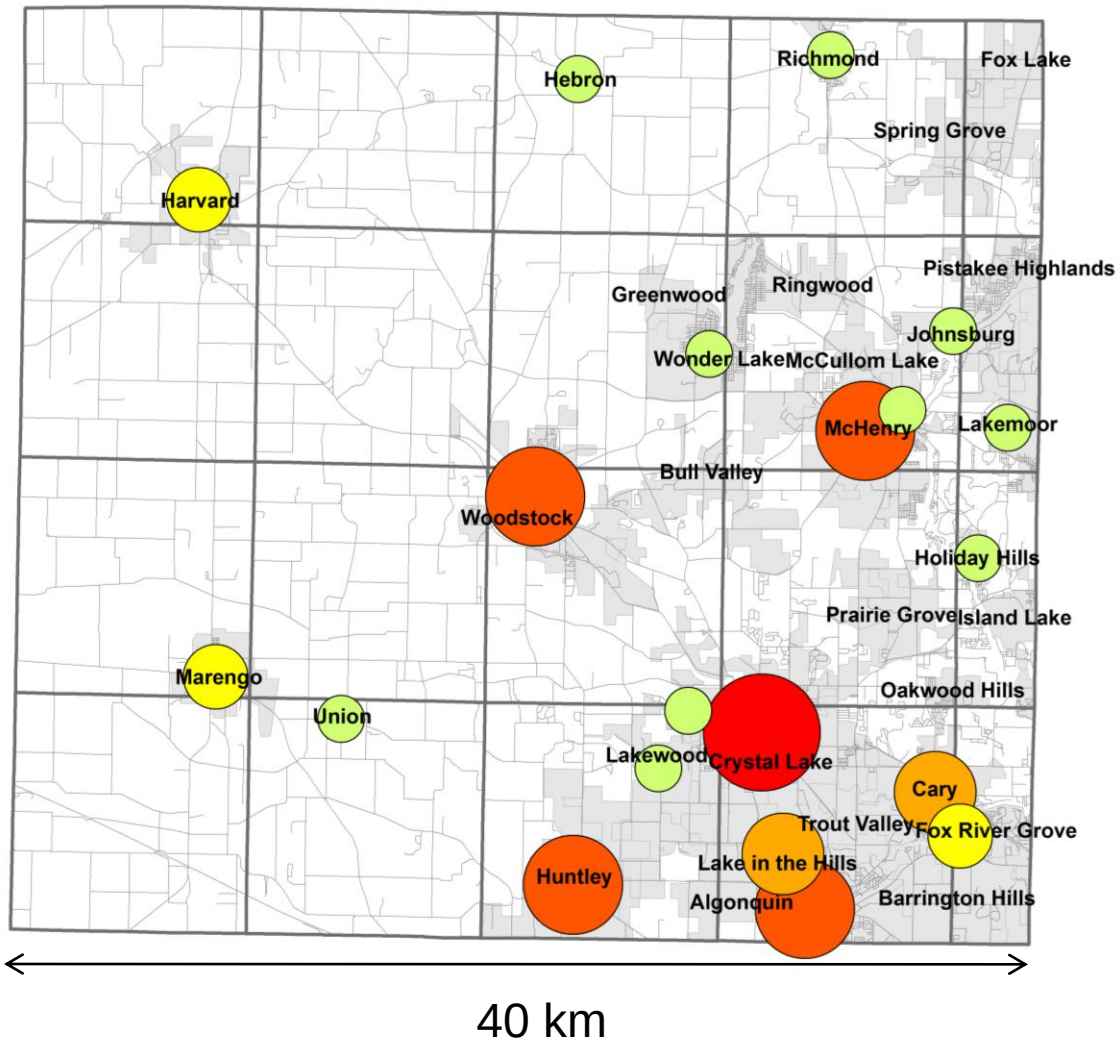
- McHenry County is <u>solely</u> dependant on groundwater for all of its potable water needs
- Adequate groundwater quantity *and* quality is <u>essential</u> to the present and future well being of McHenry County agriculturalists, residents and businesses.
- The groundwater supply is:
  - Limited
  - Vulnerable to pollution
  - Is being mismanaged

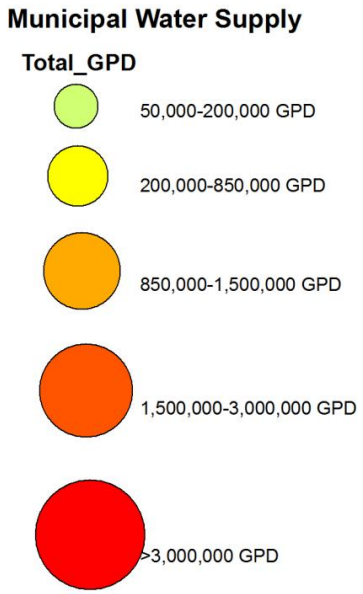
How Much Water Do We Use in McHenry County?



LRI – less resource intensive
MRI – more resource intensive

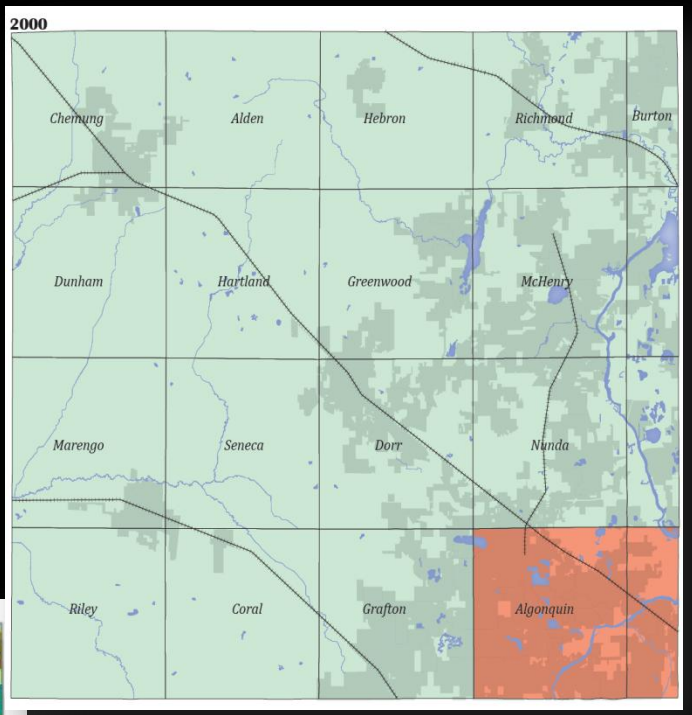
Municipal Water Supplies





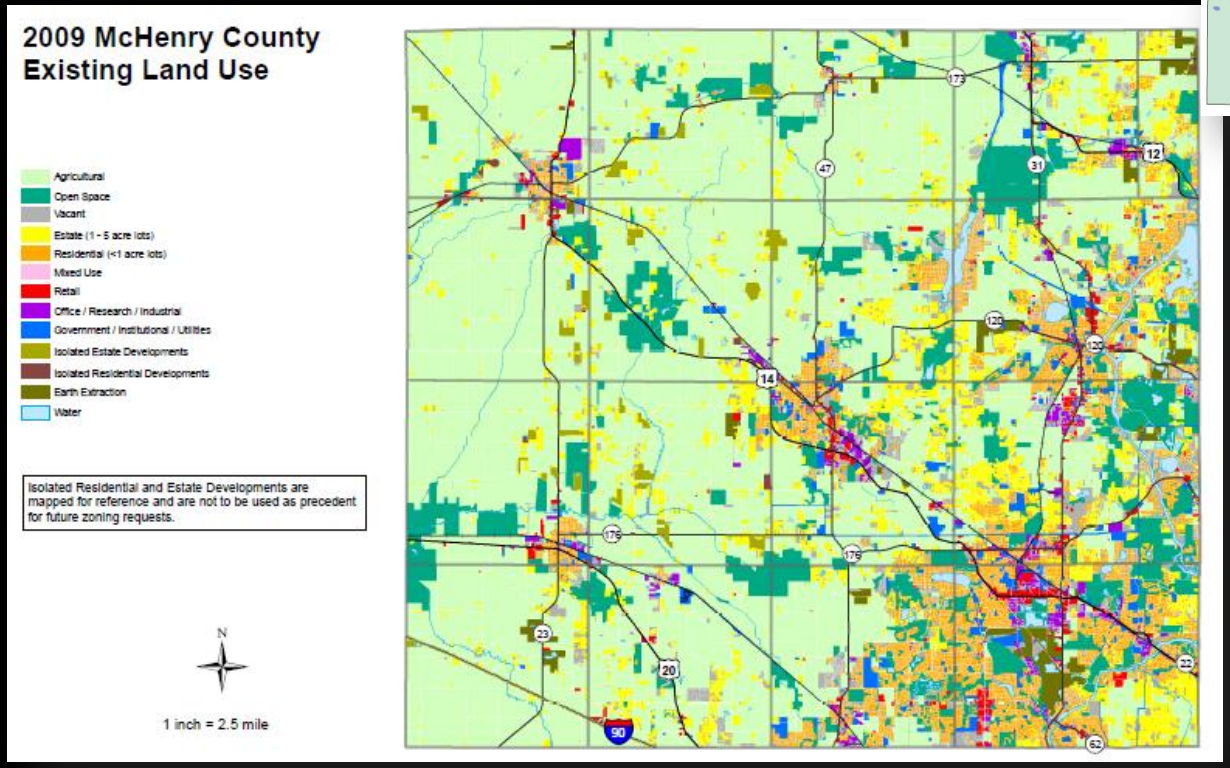
Water Supply:
100% Groundwater
~60% Sand and Gravel

Current Conditions

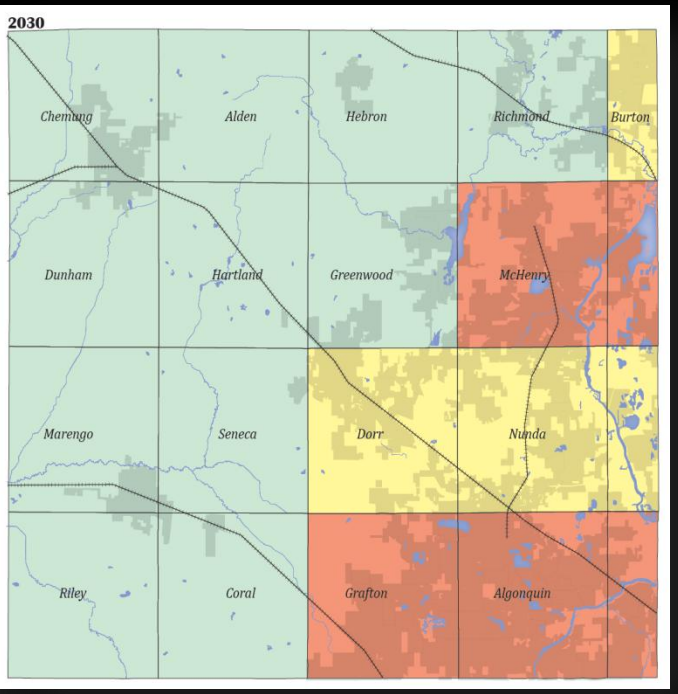


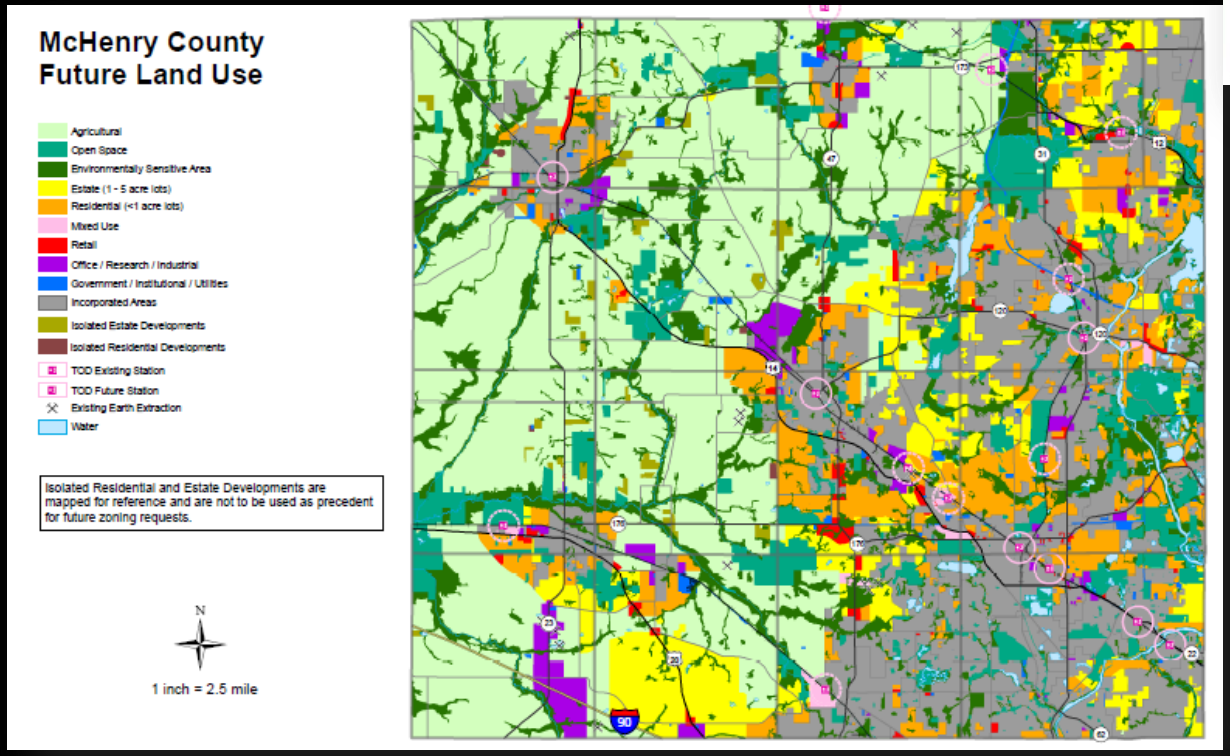
Map Legend

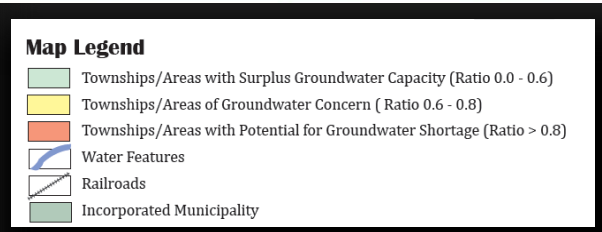
- Townships/Areas with Surplus Groundwater Capacity (Ratio 0.0 - 0.6)
- Townships/Areas of Groundwater Concern (Ratio 0.6 - 0.8)
- Townships/Areas with Potential for Groundwater Shortage (Ratio > 0.8)
- Water Features
- Railroads
- Incorporated Municipality



Future Conditions

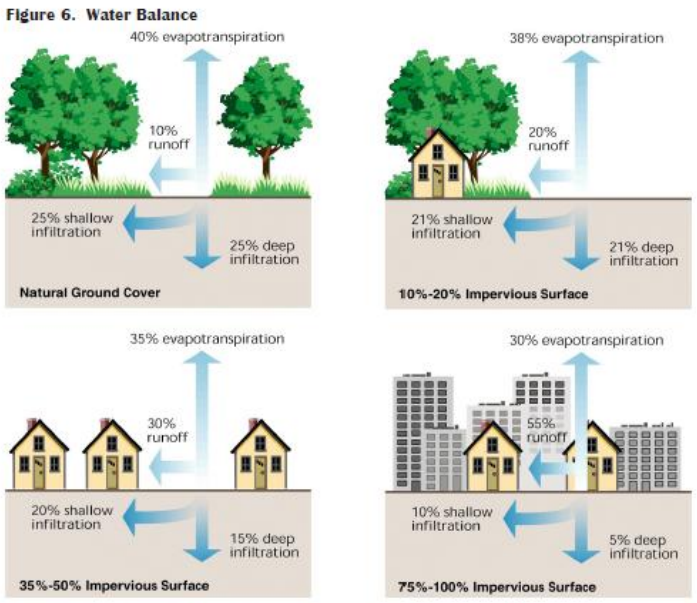






Development….

- Development Increases the Rate of Runoff
- Development Increases the Volume of Runoff
- Runoff from Developed Areas is Polluted
- Development increases the rate and volume of groundwater withdrawal



Source: "In Stream Restoration: Principles, Processes, and Practices" Fig. 3.21, Federal Interagency Stream Restoration Working Group, 1998.

Opportunity:

Create a Program to:

Protect and preserve the

quantity and quality

of groundwater for our generation and future generations, including the built and natural environment

Integrated Water Resources 7 Step Planning Process

Water Resources Action Plan:

Implementation

Steps to Implementation

1. Scientific Research = *Tools for Decision Making*
2. Symposiums, Workshops, and other Educational Offerings
    1. Municipal
    2. Public
        - Adult Education
        - Youth Education
    3. Private Business Owners
        - Agriculture, turf management, snow operators and more…
3. Municipal and County-Board Buy-in

Research and Development

Tools for Decision Making

Projects

Current:

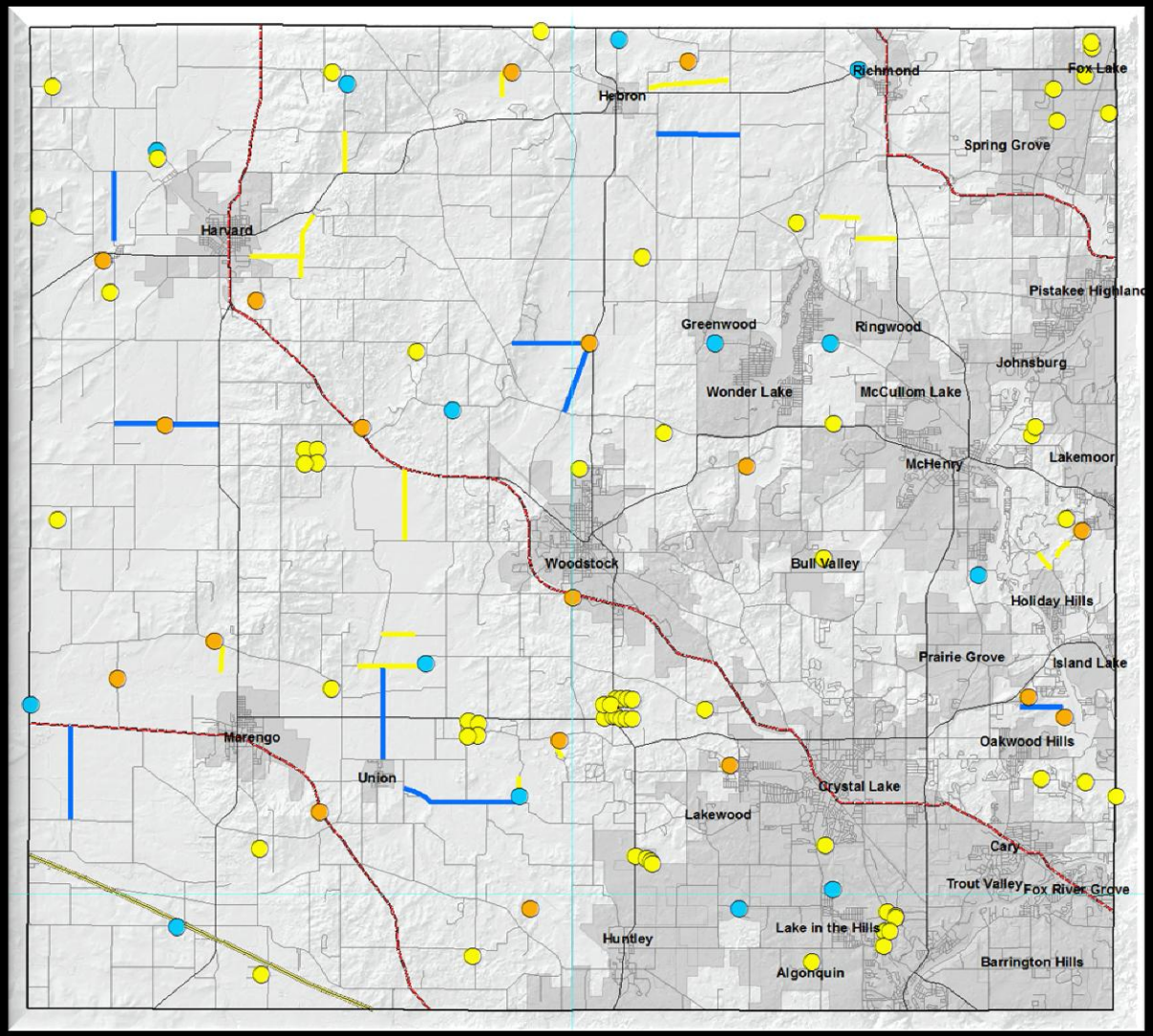
- 3-D Hydrogeological Mapping – ISGS
- Groundwater Flow Modeling – ISWS

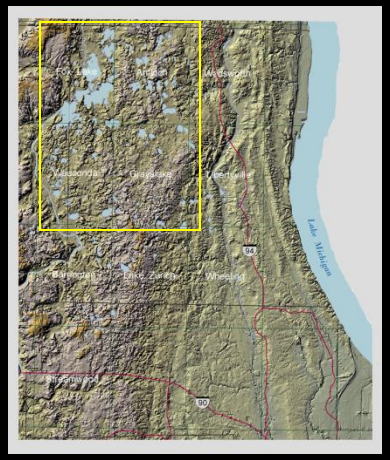
Complete:

- Installation of 44 Observation Wells – USACE and ISGS
- Real-Time Groundwater Network – USGS
- Stream Gauges - USGS
- Precipitation Gauges – USGS
- Water Quality Sampling – USACE & USGS

3-D Mapping Fieldwork

- ISGS Drilling (08-09)
- USACE (2008)
- Previous Drilling
- Geophysics

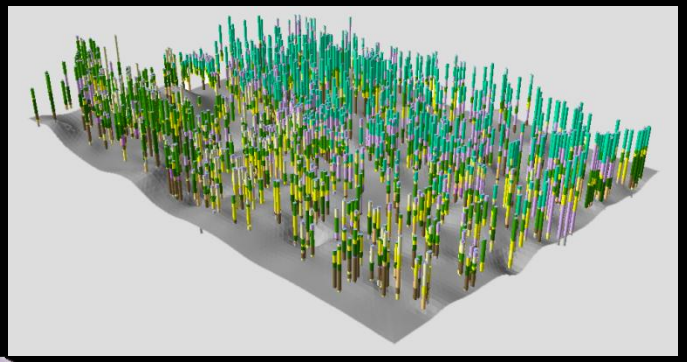


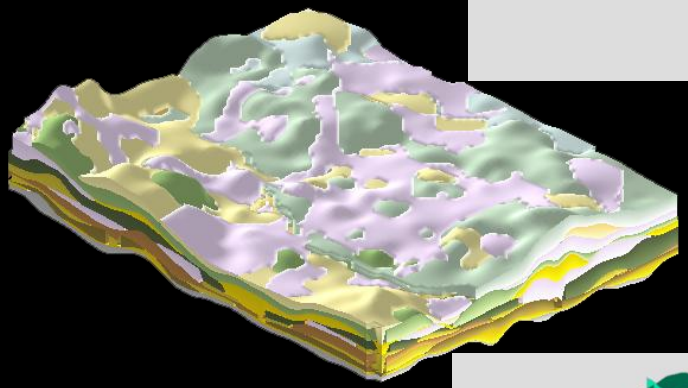


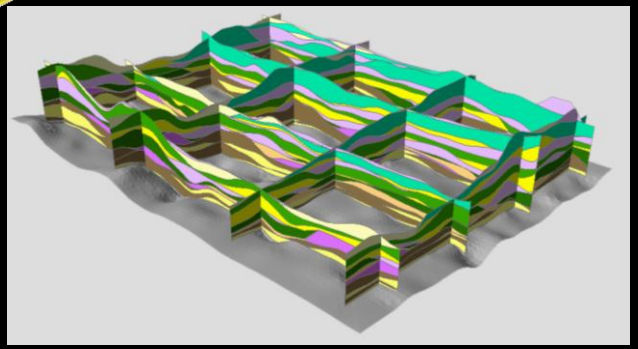
Example: Detailed 3D Hydrogeologic Mapping in Lake County, IL

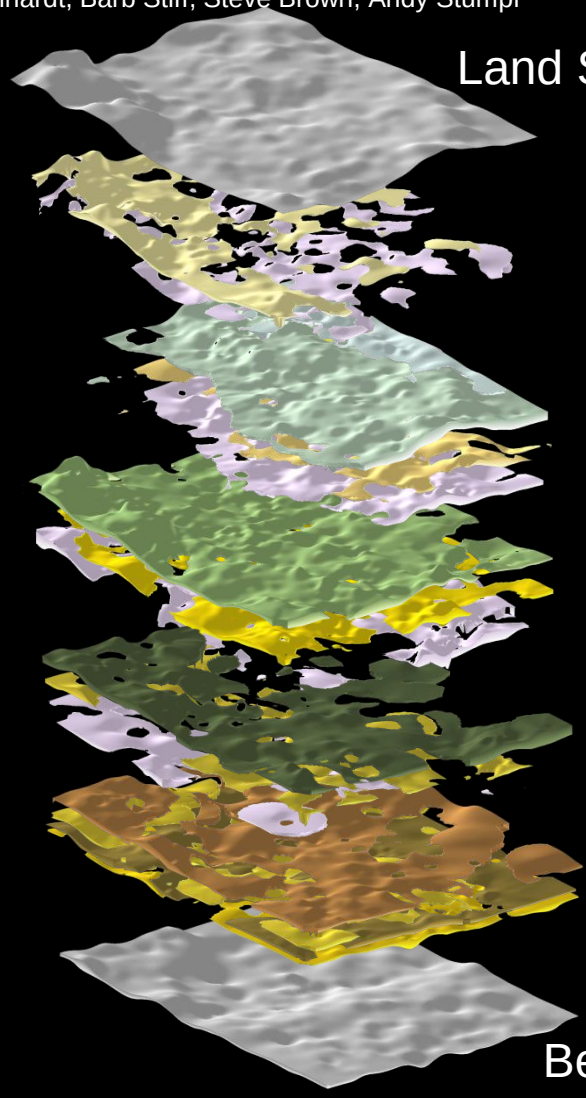
Central Great Lakes Geologic Mapping Coalition Project, ISGS

Jason Thomason, Ardith Hansel, Mike Barnhardt, Barb Stiff, Steve Brown, Andy Stumpf









Land Surface

Bedrock

Note: yellows (sand and gravel; aquifers)
greens and purples (clay rich units; aquitards)

USGS - McHenry County - Windows Internet Explorer

http://il.water.usgs.gov/data/McHenry/index.php

USGS - McHenry County

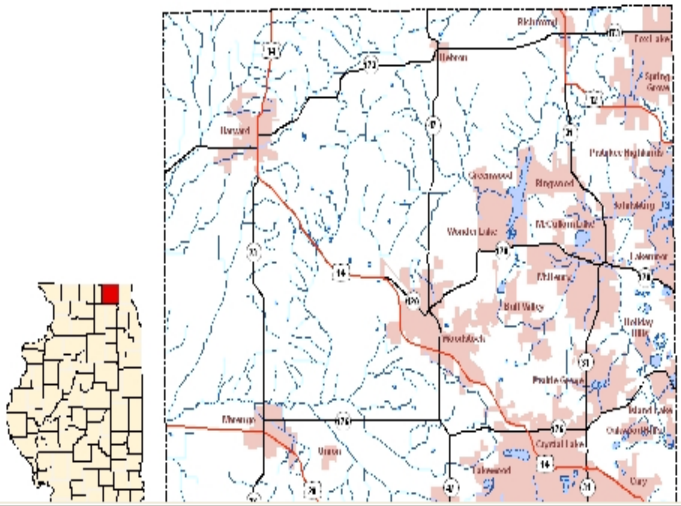
USGS science for a changing world

USGS Home
Contact USGS
Search USGS

McHenry County Data Home Page

Introduction | Ground Water | Surface Water | Rainfall | All | Water Quality | Geophysical | Publications

Welcome to the McHenry County website



McHenry County Hydrologic Information McHenry County, Illinois has current and long-term issues with water resources in providing drinking water, responsible handling of stormwater, and balancing these needs while preserving the rich and diverse ecological systems. In the effort to supply and present timely data to assist in determining the hydrologic conditions of the area, the U.S. Geological Survey (USGS) Illinois Water Science Center presents a near real-time data network of groundwater wells, streamgages and rain gages, in addition to other relevant information such as water-quality data for many of these sites.

The groundwater wells are all in glacial deposits and have well depths ranging from 20 to 345 feet. These wells have multiple owners, including those owned by the McHenry County, the Illinois State Geological Survey (ISGS) and the

Internet 100%

USGS - McHenry County - Windows Internet Explorer

http://il.water.usgs.gov/data/McHenry/gmaps.php

USGS - McHenry County

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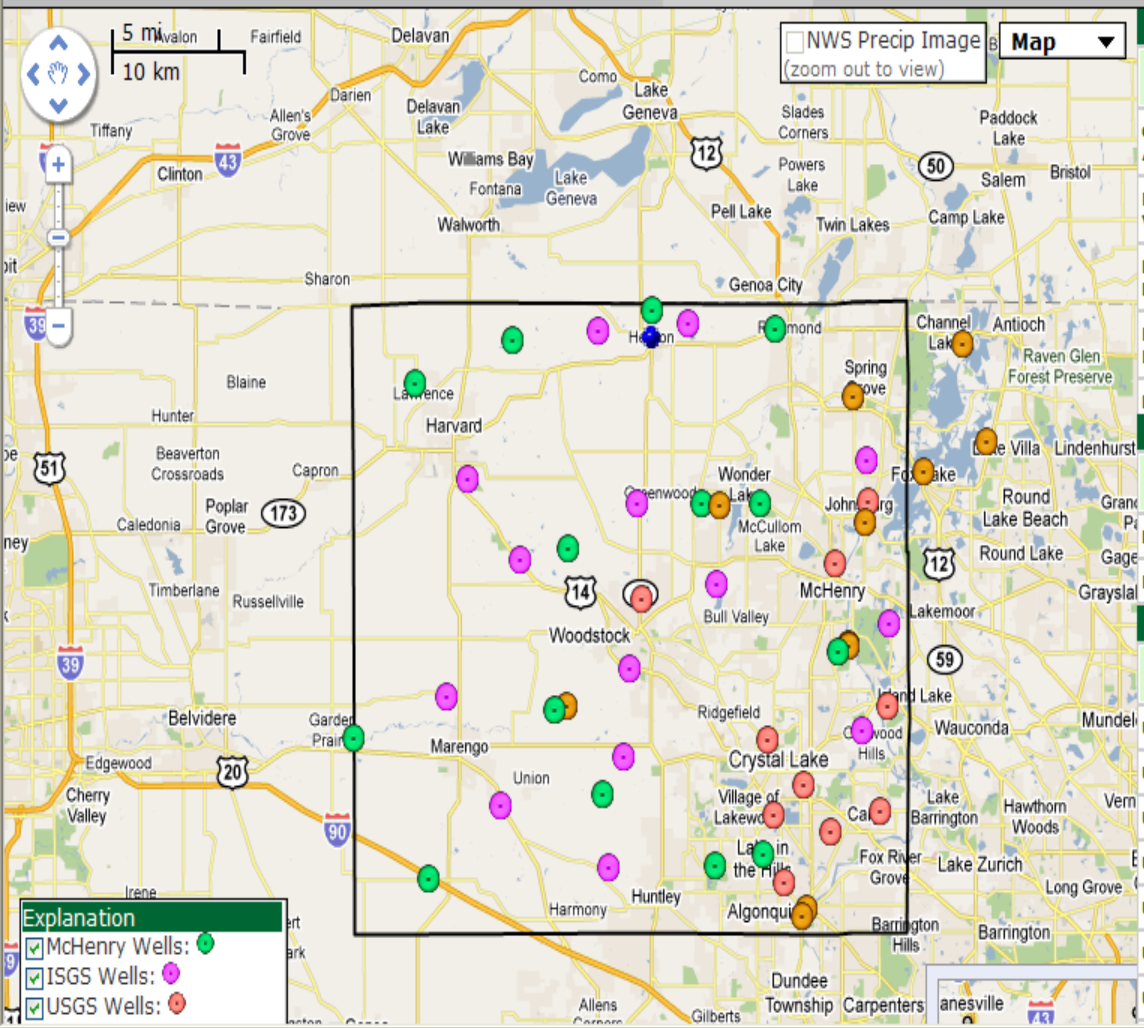


Streamflow Station Data

Station	Datum	Height	Discharge	Date
Channel Lake near Antioch, IL	733.00 feet above NGVD29.	2.96 ft	No data available	2011-01-11 12:00
Fox Lake near Lake Villa, IL	733.00 feet above NGVD29.	2.74 ft	No data available	2011-01-11 12:00
Nippersink Lake at Fox Lake, IL	733.00 feet above NGVD29.	2.54 ft	No data available	2011-01-11 12:15
Franklinville Creek at Franklinville, IL	829.83 feet above NGVD29.	6.40 ft	No data available	2011-01-11 12:15
Nippersink Creek	798.00 feet	5.01 ft	No data	2011-01-11

Rain Gage Data

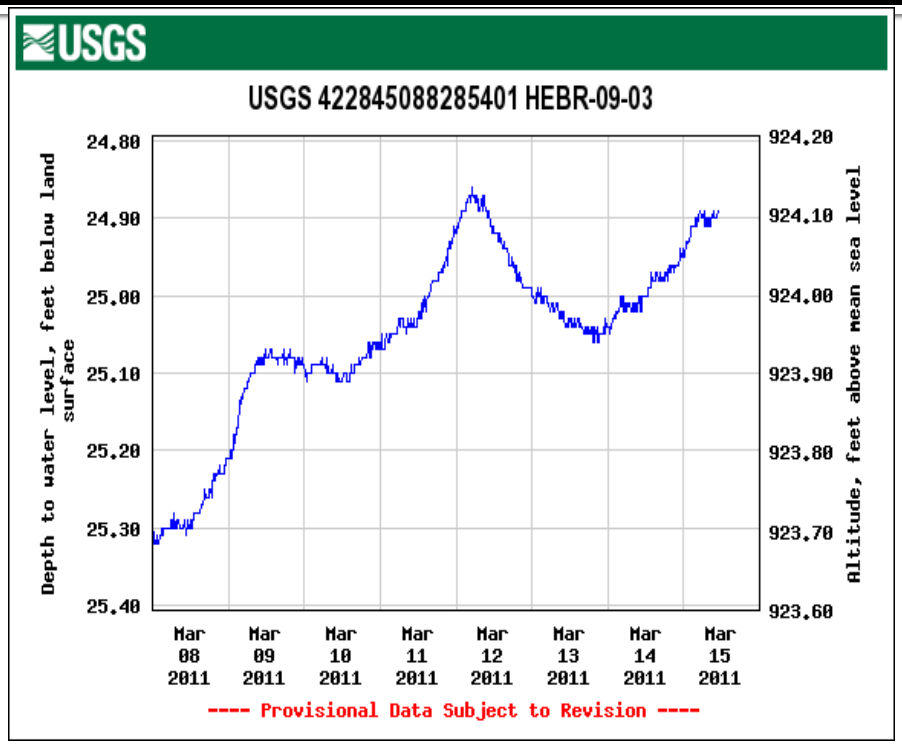
Gages	6 Hr	24 Hr
NIPPERSINK CREEK NEAR SPRING GROVE, IL	0	0
RAIN GAGE AT HEBRON, IL	0.02	0.02

Well Data

Agency ID	Owner	UGSG ID	Depth
URBLUS 02	USGS	422002088263001	Unavailable
URBLUS 10	USGS	421527088193401	Unavailable
URBLUS 11	USGS	421301088191501	Unavailable
URBLUS 14	USGS	421402088173501	Unavailable
URBLUS 13	USGS	421052088184101	Unavailable
URBLUS 20	USGS	422314088140001	Unavailable
URBLUS 21	USGS	422111088154901	Unavailable

Done | Internet | 100%

Example of a Hydrograph from Hebron Township



DESCRIPTION:

Latitude 42°28'44.84", Longitude 88°28'53.85" NAD83
Mchenry County, Illinois, Hydrologic Unit 07120006
Well depth: 120.6 feet
Hole depth: 234 feet
Land surface altitude: 949feet above sea level NAVD88.
Well completed in "Sand and gravel aquifers (glaciated regions)" (N100GLCIAL) national aquifer.
Well completed in "Quaternary System" (110QRNR) local aquifer

Sensitive Aquifer Recharge Areas Map

Groundwater Recharge

- **Recharge is the entry of groundwater into the saturated zone of water made available at the water-table surface, together with the associated flow away from the water table within the saturated zone. (Freeze & Cherry, 1979)**

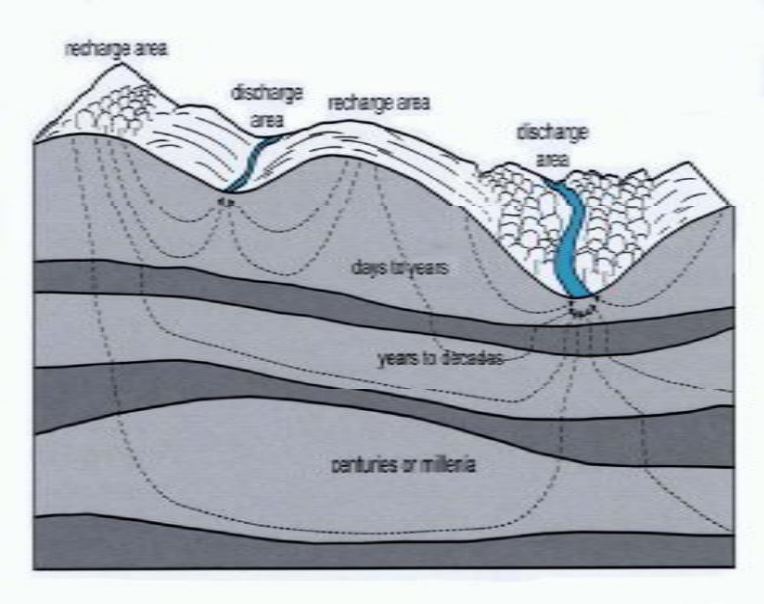
- Recharge … is imperative to the proper management and protection of valuable groundwater resources. (Healy & Cook, 2002)

- Rate of aquifer recharge is one of the most difficult factors to measure in the evaluation of groundwater resources. (Sophocleous, 1991)

- A wide variety of approaches should be applied in estimating recharge to reduce uncertainties and increase confidence in estimates. (Scanlon et al., 2002)

Groundwater Recharge

- Location and timing of recharge is controlled by (Scanlon et al., 2002):
  - – Climate
  - – Geomorphology
  - – Geology
- Humid areas
  - – Shallow water tables
  - – Gaining streams
  - – GW discharged as ET and stream baseflow
  - – Diffuse recharge is dominant



Sensitive Aquifer Recharge Areas Map

Why such a map?

Groundwater increasingly recognized as:

- McHenry County's most valuable resource
- Limited resource
- Vulnerable resource
- Need for a sustainable quantity and quality for future economic stability of County

Impacts of Imperviousness on Surface Water and Groundwater Quantities – Pheasant Branch Creek

Type of Water Resource	***Impervious Increase from 2% to 18%***	***Impervious Increase from 2% to 60%***
Stream Baseflow	-20%	Dry Stream
Surface Runoff	+90%	+485%
Regional Groundwater	-10%	-55%

McHenry County
Sensitive Aquifer Recharge Areas Map

- IS a *refinement* and *integration* of data and maps that have been vetted, accepted and used for several years.

IT is a planning tool!

Sensitive & Recharge

- **Sensitive** areas rapidly transport liquids through their geologic materials to a shallow aquifer

- **Recharge** areas rapidly transport water through their geologic materials to a shallow aquifer

Sensitive = Good Recharge

Sensitive = High Potential for Contamination

What is Recharge?

- If it flows across the surface it is **RUNOFF.**
- If it enters the soil it is **INFILTRATION.**
- When it reaches a usable aquifer its **RECHARGE.**

Infiltration

- The Baxter & Woodman Groundwater Resources Management Plan assumed a uniform infiltration rate across the county.

- This map aims to show a more realistic depiction of where infiltration and recharge occur.

Geological Mapping for Environmental Planning ISGS Circular 559 McHenry County ('97)

Provides a geological/hydrogeologic framework that:

- Identifies aquifers within 100 ft of the surface 70%of County
- Defines thickness & distribution of aquifers & aquitards
- Rates relative sensitivity of aquifers to contamination
- Predicts relative impact of land uses on an given aquifer

Circular 559
Aquifer Sensitivity Map Units

- **Map Unit A** – High potential for aquifer contamination
- **Map Unit B** – Moderately High potential for aquifer contamination
- **Map Unit C** – Moderate potential for aquifer contamination
- **Map Unit D** – Moderately Low potential for aquifer contamination
- **Map Unit E** - Low potential for aquifer contamination

Excessively Permeable Soils

- **McHenry County Soil Survey Permeability**

Very Rapid	>20”/hr
Rapid	6-20”/hr
Moderately Rapid	2-6”/hr
Moderate	0.6-2”/hr
Moderately Slow	0.2-0.6”/hr
Slow	0.06-0.2”/hr
Very Slow	<0.06”/hr

SOIL S:
Permeable /Non Permeable Soils

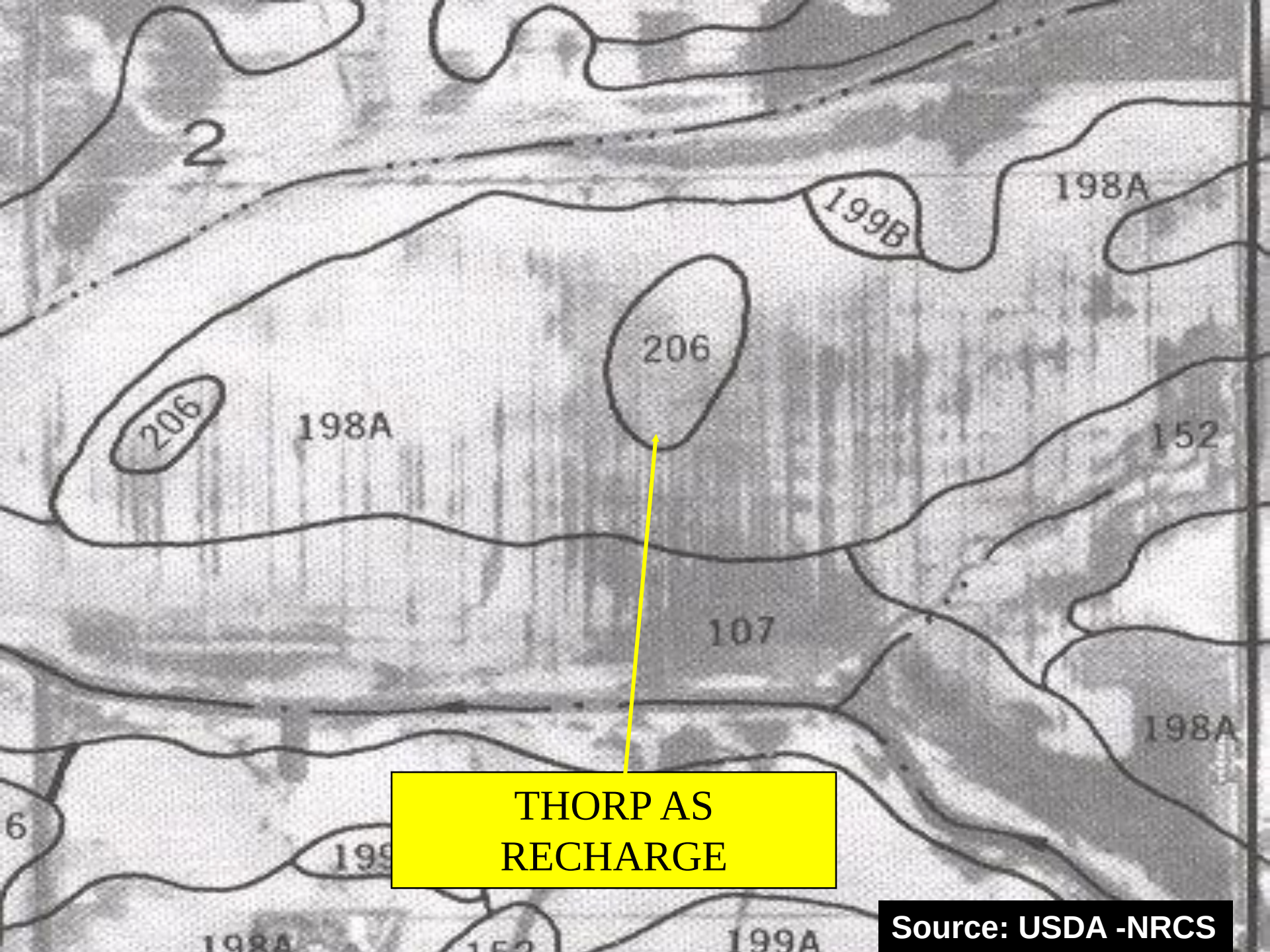
- Sand and Gravel
- Hydric

Map Applications

- Evaluate a given area for water resources protection
- Assess risk of aquifer contamination in a given area
- Provide appropriate BMPs & land uses to protect identified sensitive recharge areas
- Assess the risk of flooding in a given area
- Assess well densities & septic system impacts

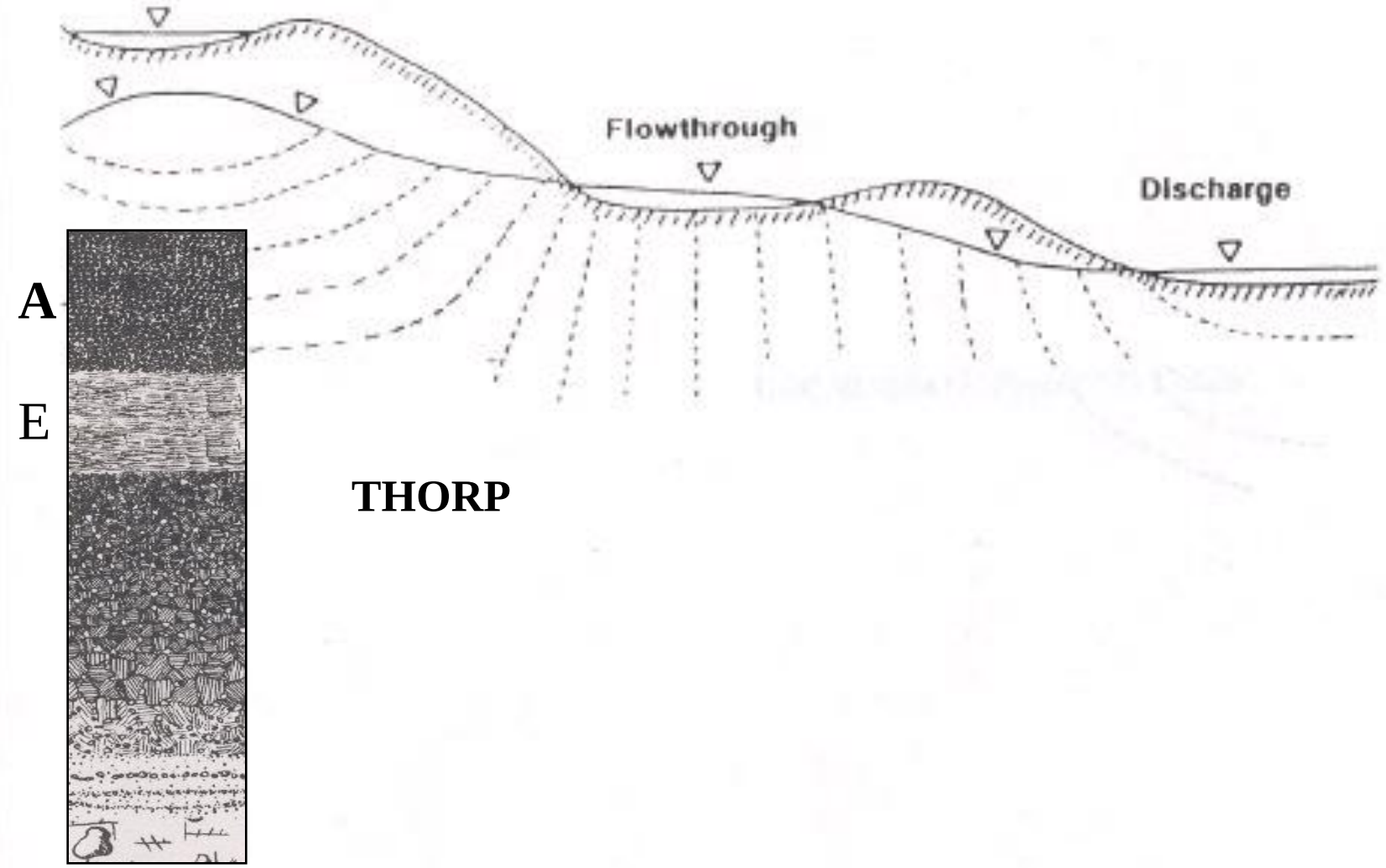
Map Limitations

- Specific Site characteristics must be evaluated individually
- Existing land use impacts, such as wells & septics, must be evaluated per site
- Areas at or near boundaries are not well defined
- Surface drainage not mapped in detail


2
199B
198A
206
206
198A
152
107
198A
6
199
198A
199A
THORP AS
RECHARGE
Source: USDA -NRCS

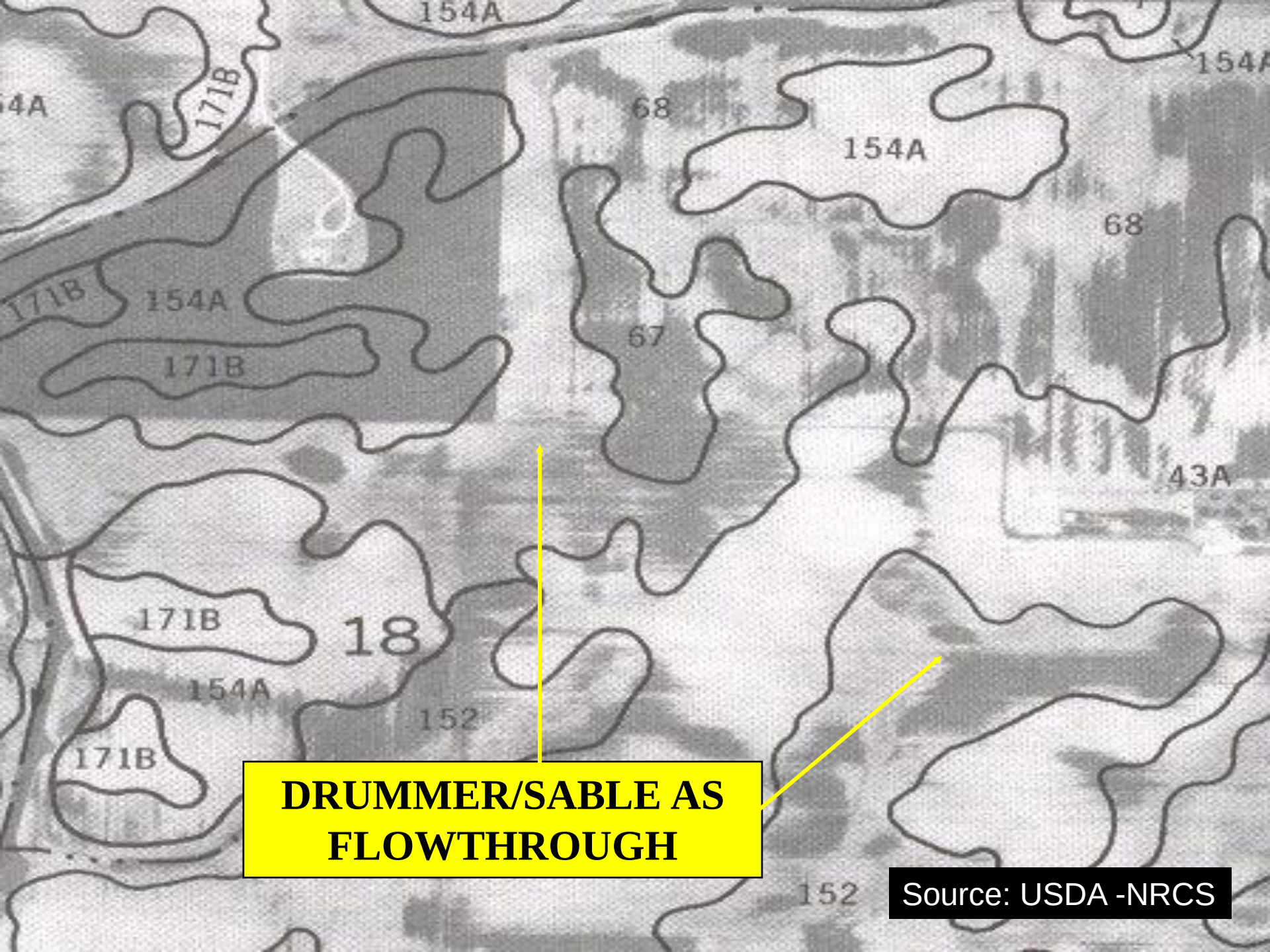
THE HYDRIC SOIL-SCAPE

RECHARGE

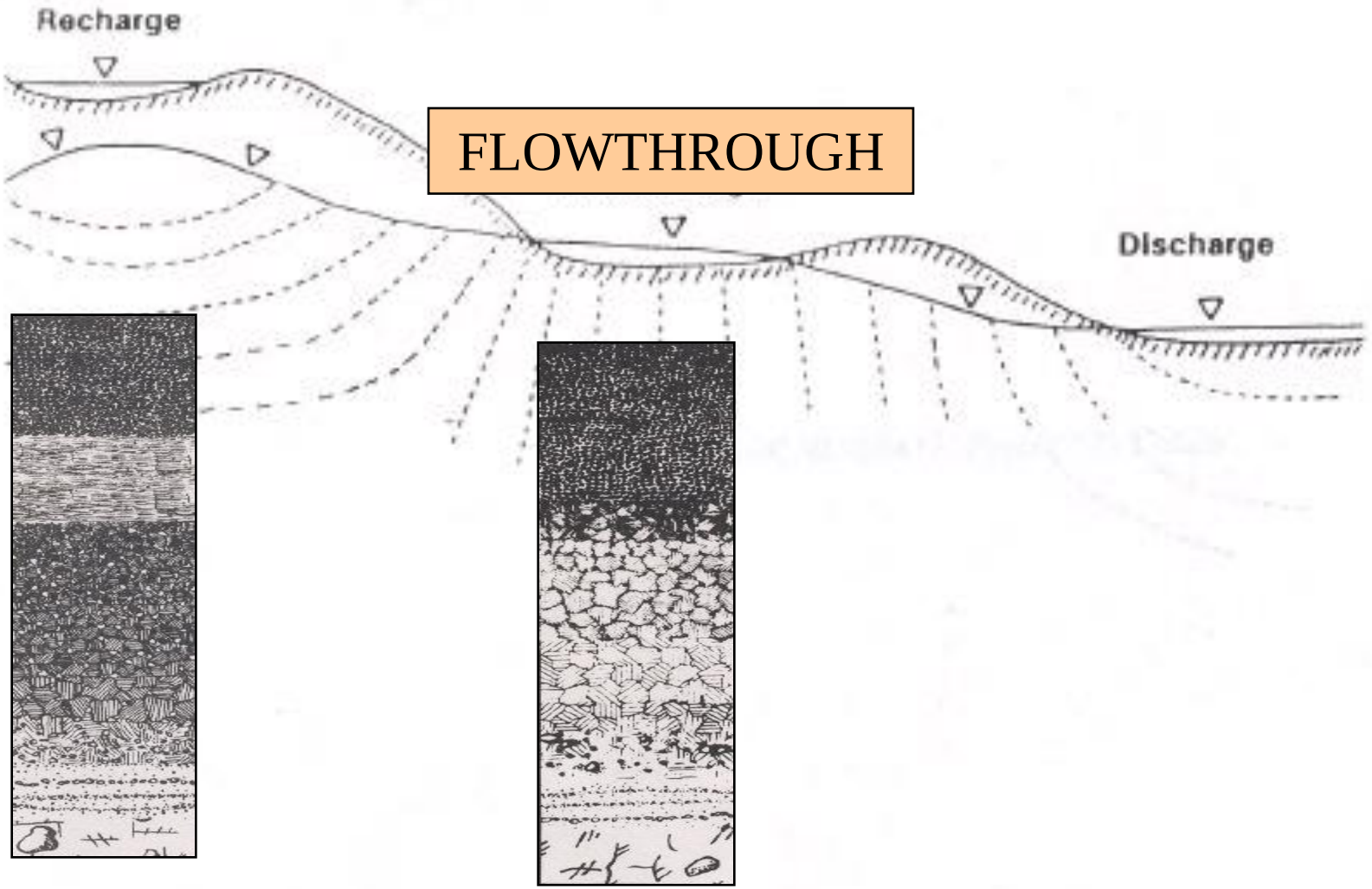


THORP

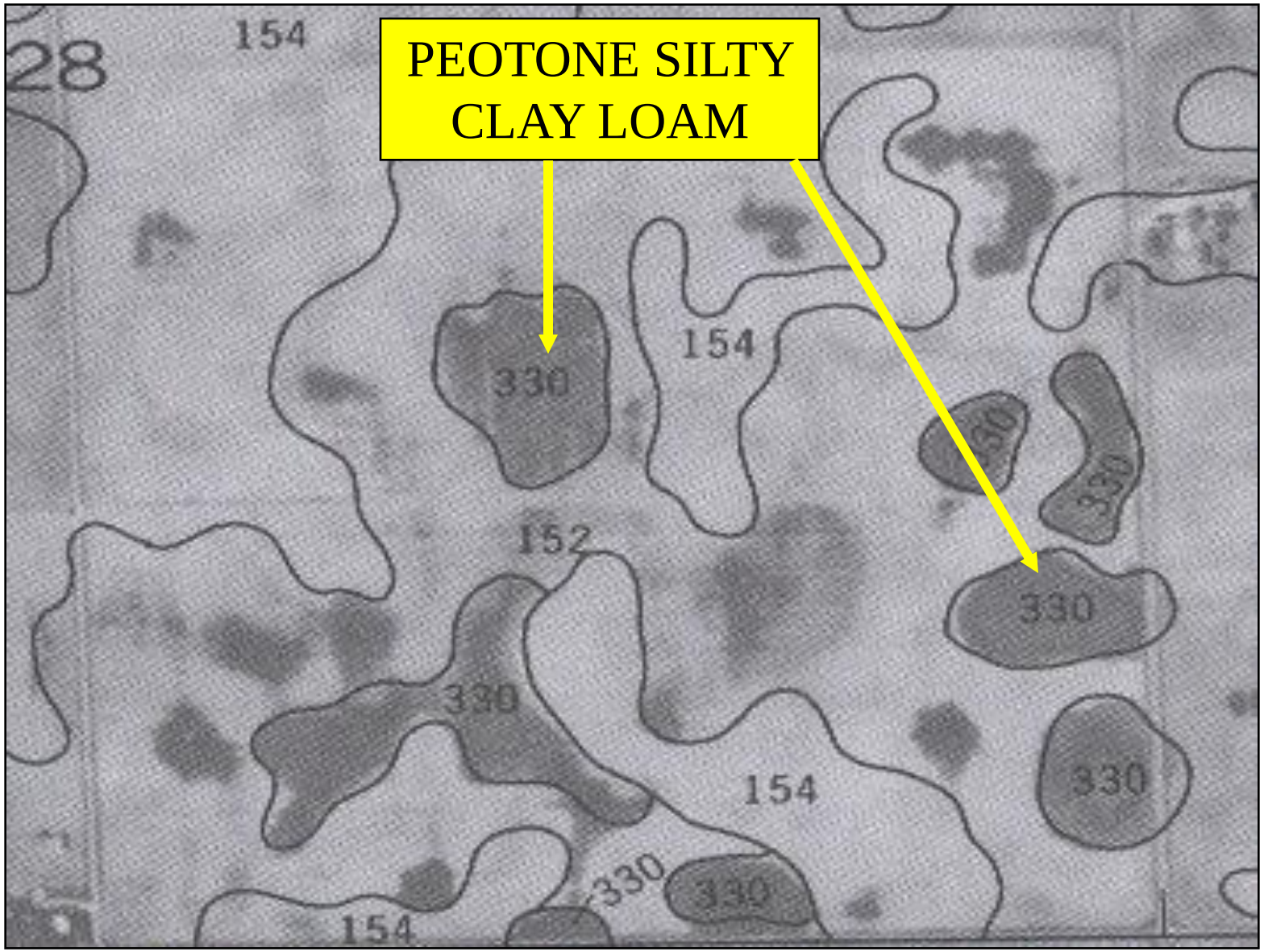
Source: USDA -NRCS


154A
171B
68
154A
68
171B
154A
67
171B
43A
171B
18
154A
152
171B
152
DRUMMER/SABLE AS FLOWTHROUGH
Source: USDA -NRCS

THE HYDRIC SOIL-SCAPE



Source: USDA -NRCS



Source: USDA -NRCS

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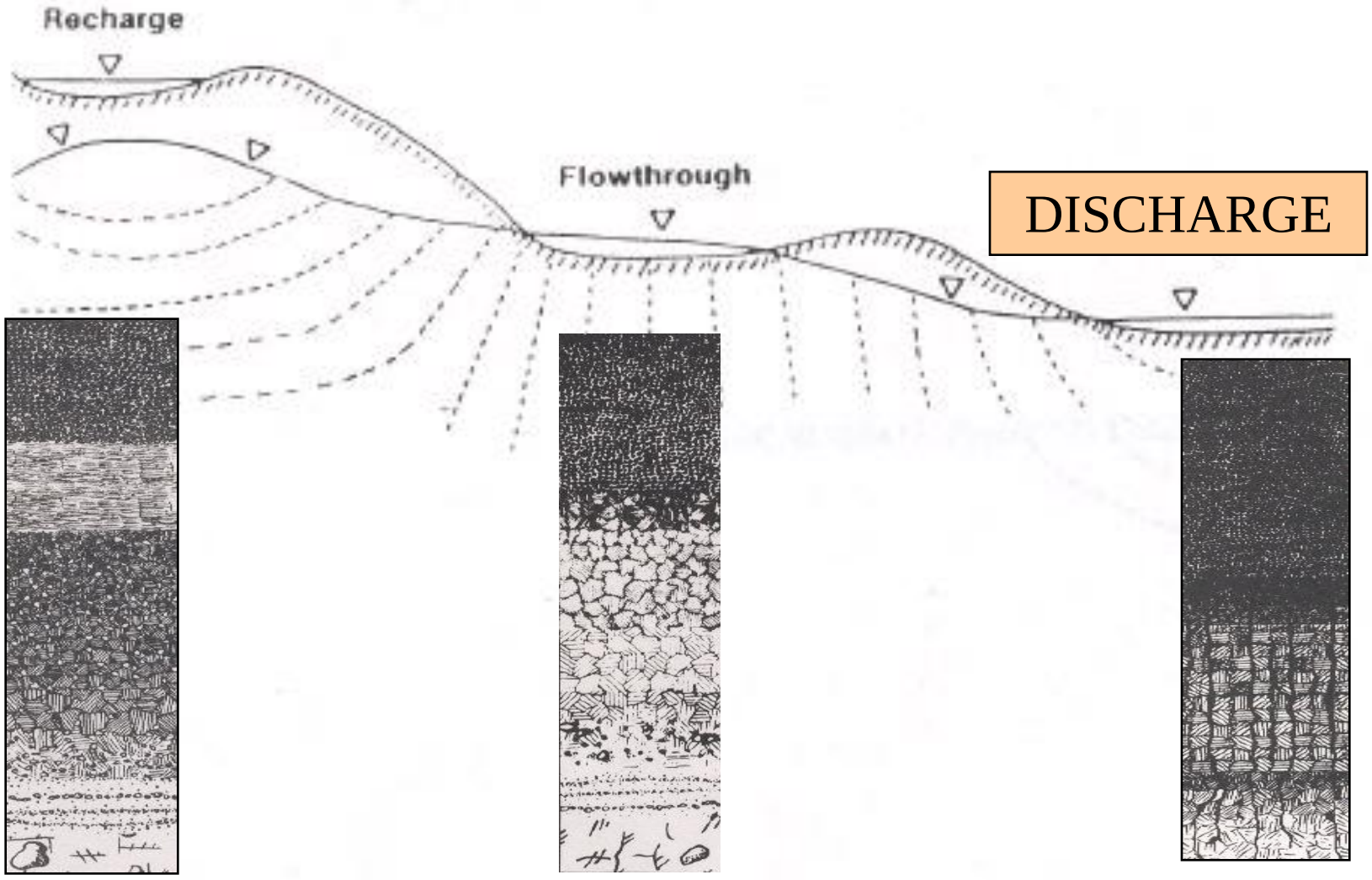
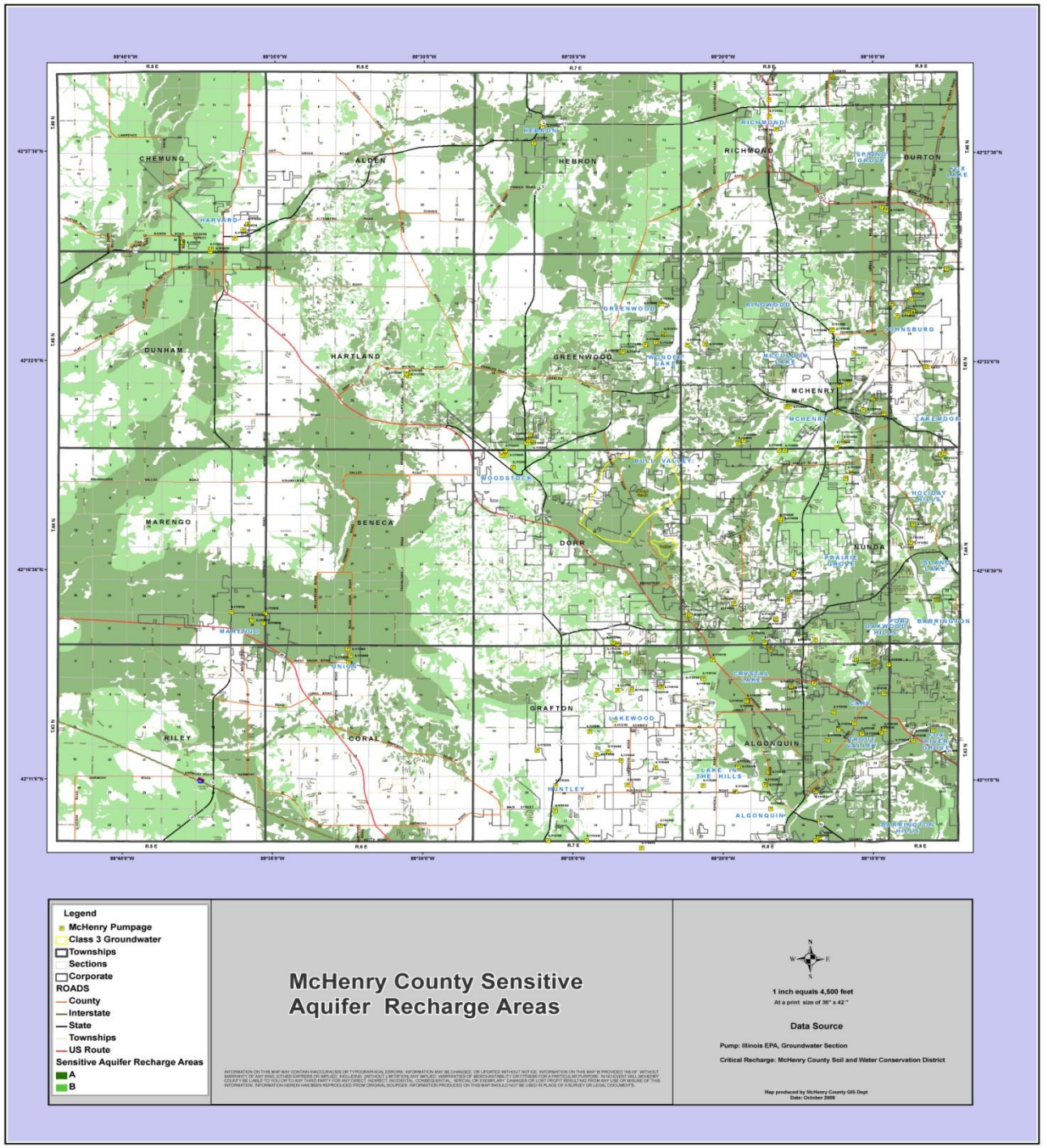


Source: USDA -NRCS

McHenry County Sensitive Aquifer Recharge Areas

Final Map
10/14/2008



Sensitive Aquifer Recharge Areas Map

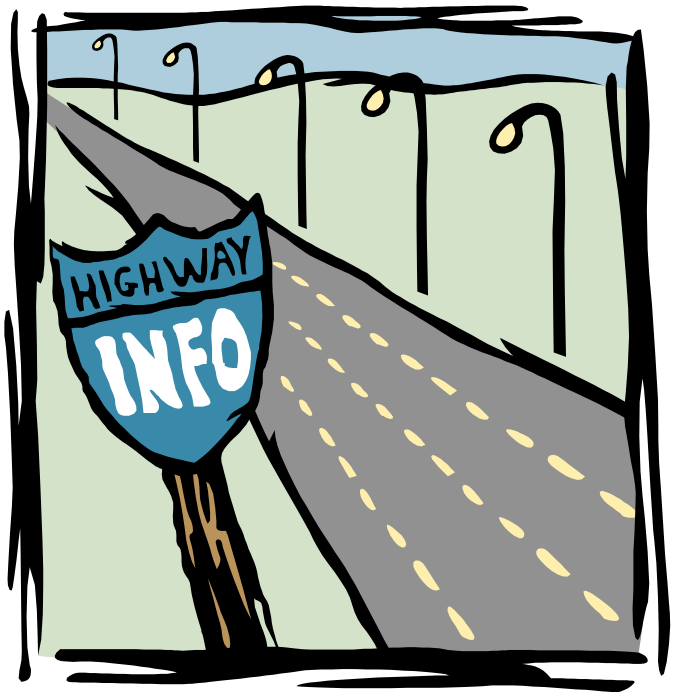
- Map:
  - Goal – to integrate into land-use planning:
    - To identify and protect those areas susceptible to contamination and most valuable for recharging the underlying shallow aquifer system.
- The map indicates the level of evaluation and/or protection necessary for potential development of that site.

Other Applications?

- Sole Source Aquifer Protection
- Regulated Recharge Areas

Water Resources Website!

- ✓Water Resources Action Plan
  - ✓Model policies and ordinances
- ✓Children's Activities
- ✓Teacher Lesson Plans
- ✓Brochures
- ✓Groundwater Research
- ✓ Newspaper Articles

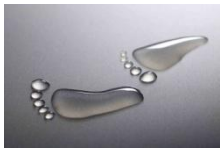


www.mchenryh2o.com

Closing Thoughts:

- ✓Best practices alone are not enough.
- ✓Sound science is vital for resource protection
- ✓Communication is Key!
- ✓*Be a part of the solution, every drop counts!*

QUESTIONS?



"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."

Aldo Leopold, A Sand County Almanac

Cassandra McKinney

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Sole Source Aquifer Protection

- **What is a Sole Source Aquifer?**
  - An aquifer designated by EPA as the "sole or principal source" of drinking water for a given aquifer service area;
    - that is, an aquifer which is needed to supply 50% or more of the drinking water for that area and for which there are no reasonably available alternative sources should the aquifer become contaminated.
- **Benefits**
  - Projects would be subject to EPA review:
    - Special precautions to be exercised by federal agencies for proposed federal financially assisted projects that have the potential to contaminate the SSA area
  - SSA designation is a prerequisite for a State or municipality to qualify for consideration for funding under a separate EPA program, the SSA Demonstration Program.

For More Information:

Bill Spaulding
United State Environmental Protection Agency
Region 5
Sole Source Aquifer Coordinator
(312) 886-9262

Website:
http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=SSA

Regulated Recharge Areas

- **Section 3 of the IGPA**
  - "Regulated recharge area" means a compact geographic area, as determined by the Board, the geology of which renders a potable resource groundwater particularly susceptible to contamination."
  - **Requires:**
    - Groundwater Protection Needs Assessment (GPNA)
      - Recommending a recharge area program be established.
- Focus is on Quality protection.

Example: Pleasant Valley Regulated Recharge Area

35 Ill. Adm. Code 617

Source: Illinois Environmental Protection Agency

For More Information:

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